CLAIMS

What is claimed is:

1. A method for transforming a signal (DS) on a four-wire line which comprises discrete amplitude height values (P1, ..., Pn) for conversion into a corresponding analog signal (AS) with amplitude height values (A1, ..., An) on a two-wire line where said analog signal (AS) is intended for a data communication unit connectable to the two-wire line and where said data communication unit has a predefined capability for resolution of the amplitude of said analog signal (AS) and said method being determined by: said amplitude height values (P1, ..., Pn) of signal DS on the four-wire line are each transformed by application of a transformation (T) where said transformation is determined in such a way that the number (n) of said amplitude height values (A1, ..., An) which said communication unit can discern in said analog signal (AS) matches a presetable criterion (K).

2. A method according to claim 1, wherein said criterion (K) is a maximum number (n) of discernable amplitude height values.

3. A method according to claim 1, wherein said criterion is a preset range of said number (n).

4. A method according to one of the previous claims, wherein said transformation (T) is a multiplication of said amplitude height values (P1, ..., Pn)

with a factor (V).

5. A method according to one of the previous claims, wherein said factor (V) is calculated by the determination of the constellation of said signal (DS).

6. A method according to one of the previous claims, wherein said factor (V) is calculated by the determination of the minimal difference (Dmin) of two amplitude height values (Ai, Aj) of said analog signal (AS) that said communication unit (10) can discern.

7. A method according to one of the previous claims, wherein said signal (DS) comprises amplitude height values (P1, ..., Pn) according to a predefined characteristic, in particular a characteristic adhering to ITU recommendation G.711.

8. A method according to one of claims 4 to 7, wherein said factor V is calculated from the constellation of said signal (DS) where the amplitude height values (P1, ..., Pn) are multiplied with a predefined small factor (V0), in particular a factor for which for at least three amplitude height values (Pc, Pf, Ph) the discernable amplitude difference deviates less than 25% from the respectively previous amplitude height value.

9. A method according to claim 8, further comprising for the calculation of said factor (V) the steps of:

a) determination of the smallest amplitude height value said data communication unit can discern (Amin);

b) determination of the largest amplitude height value (Amax) for whose

corresponding universal code (UCODE) difference to the next larger amplitude height value a predefined condition is met;

c) calculation of the amplitude height difference (D) of said largest amplitude height value (Amax) and said smallest amplitude height value (Amin);

d) counting the number of amplitude height values in between the largest and the smallest amplitude height value of the constellation and reducing said number by 1;

e) calculation of the quotient (Q) of said amplitude height difference (D) and said reduced number;

f) multiplication of said predefined factor (V0) with said quotient (Q)

10. A method according to claim 9, wherein said predefined condition is "at least 4".

11. A method according to claim 9 or 10, wherein in front of step (f) said factor (V0) is further reduced.

12. A method according to one of the previous claims, wherein said transformation is done by replacing each amplitude height value (P1, …, Pn) according to a mapping by a predefined amplitude height value.

13. A method according to claim 12, wherein the mapping is calculated by the multiplication of said amplitude height values (P1, …, Pn) with a predefined factor (V).

14. A method according to one of the previous claims, wherein said transformed amplitude height values (P1, …, Pn) exhibit a predefined accuracy, in particular at least 12 bit.

15. A method according to claims 1 to 11, wherein said signal (DS) is an analog signal.

16. A method according to one of the previous claims, wherein said communication unit (10) is a PCM modem and said signal (DS) originates form a digital modem (50).

17. A method to detect the presence of a modem connection from said signal (DS) comprising the steps of:

a) checking, whether said signal (DS) exhibits a silence period in the range of 70 to 80 ms and, if the signal amplitude matches a predefined low amplitude height value during said silence period, issuing a modem detect signal;

b) otherwise, if the silence period exceeds 80 ms, checking whether the signal following the silence period (DS) represents a predefined characteristic signal of a PCM modem and, if positive, issuing a modem detect signal.

18. A method according to claim 17, wherein a sequence of ten amplitude height values P1, …, P10, followed by the same sequence with negated sign –P1, …, -P10 is detected as said characteristic signal.

19. A method according to claim 18 wherein a periodic sequence of six amplitude height values comprising three constant positive values P and three constant negative values –P is detected as said characteristic signal.

20. A method according to claim 17, wherein a periodic sequence of the amplitude height values P, 0, P, -P, 0, -P with 0 being the smallest valid amplitude height value and P being any other valid amplitude height value is detected as said characteristic signal.

21. A method according to one of the claims 17 to 20, wherein for modem detection amplitude height values with a deviation of up to two levels from the amplitude height values required for detection are mapped to that amplitude height value.

22. A method according to claims 1 to 16 wherein as a first step a modem detection is performed, preferably according to a method as claimed in claims 16 to 20, and the following steps are only taken if a modem connection has been detected.

23. A method according to one of the previous claims implemented in a network termination unit.

24. An apparatus adapted for the implementation of the methods according to one of the previous claims.

25. An apparatus according to claim 24, wherein means for storing a mapping are provided, said means suitable for storing amplitude height values that replace said amplitude height values (P1, …, Pn) accordingly.

26. An apparatus according to claim 25, wherein said mapping is calculated by the multiplication of the predetermined amplitude height values with a factor (V).

27. An apparatus according to the previous claim, further comprising means to store the constellation.

28. An apparatus according to one of the claims 24 to 27, wherein said means for storage of said constellation comprise at least six memory segments where each segment has enough capacity to assign one memory element to at least those amplitude height values for which the discernable amplitude difference deviates less than 25% from the respectively previous amplitude height value.

29. An apparatus according to one of the previous claims referring to apparati, wherein an implementation in a network termination unit is intended.

30. An apparatus according to one of the previous claims referring to apparati, wherein the apparatus is activated at the start of a data communication between a transmission unit and said communication unit.

31. An apparatus according to one of the previous claims referring to apparati, wherein said communication unit (10) is an analog PCM modem and said signal (DS) is generated by a digital modem (50).

32. An apparatus according to one of the previous claims referring to apparati, further comprising a control unit (40), in particular a microcontroller or a digital signal processor.

33. An apparatus for detection of a modem connection from a signal (DS) comprising:

a) first means (310, 315, 316) to check whether said signal (DS) comprises amplitude height values corresponding to a silence period in between 70 and 80 ms;

b) second means (320, 325, 326, 330) to check whether said signal (DS) following said silence period is a predefined characteristic signal of a PCM modem;

c) means (340) for issuing a modem detect signal.

34. An apparatus according to claim 33, further comprising means (300), in particular a ring buffer, for storing at least 10 amplitude height values.

35. An apparatus according to claim 33 or 34, wherein a sequence of ten amplitude height values P1, ..., P10, followed by the same sequence with negated sign –P1, ..., -P10 is detected as said characteristic signal.

36. An apparatus according to one of the claims 33 to 35, wherein said second means (320, 325, 326, 330) are implemented in such a way that a periodic sequence of six amplitude height values comprising three constant positive values P and three constant negative values –P is detected as said characteristic signal.

37. An apparatus according to one of the claims 33 to 36 wherein said second means are implemented in such a way that a periodic sequence of the amplitude height values P, 0, P, -P, 0, -P with 0 being the smallest valid amplitude height value and P being any other valid amplitude height value is

detected as said characteristic signal.

38. An apparatus according to one of the claims 33 to 37, wherein for modem detection amplitude height values with a deviation of up to two levels from the amplitude height values required for detection are mapped to that amplitude height value.

39. An apparatus according to one of the claims 33 to 38, further comprising a modem detection unit, in particular one according to claims 30 to 34.

40. A codec device (21) that contains an apparatus according to one of the apparatus claims.

41. A network termination unit (2) that contains an apparatus according to one of the apparatus claims.